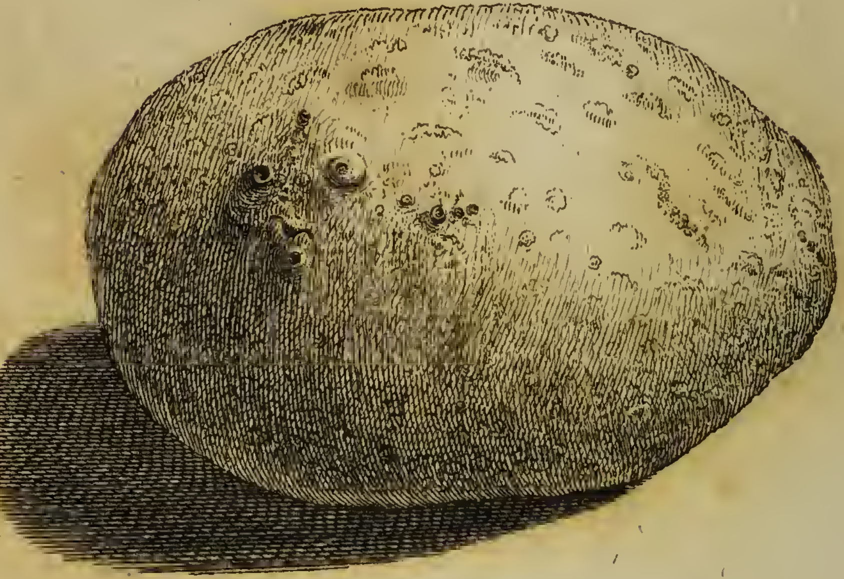
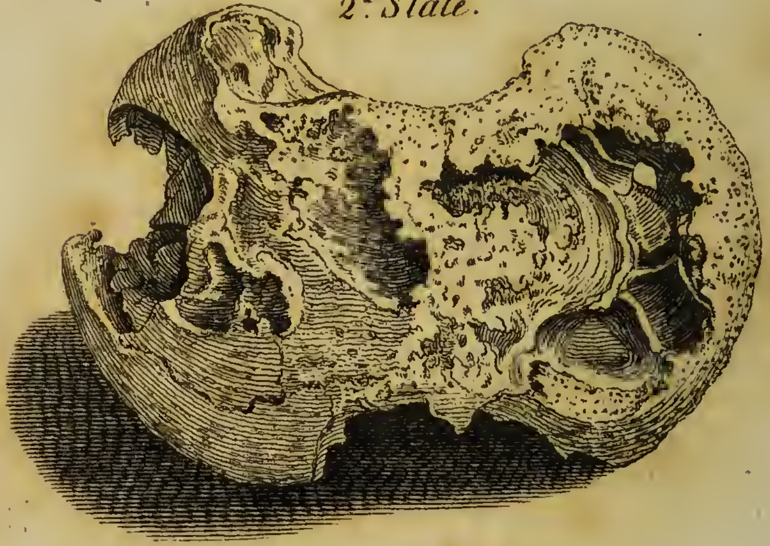
This refers to what is said page 49.

1st State.



2d State.



Mr. Underwood took Mrs. Stephens's Solvent for the stone Six months, during which time he voided many flakes and pieces of Stone. He died March. 1. 1739. I took out, says Mr. Sharp, the Surgeon, from Mr. Underwood, a stone, that had the appearence of being much waſted, moſt of the Shell being deſtroyed, and very much of the internal Subſtance eaten into, so as in some meaſure to reſemble a carious bone.

The bladder was in a very healthy state.

You have here a repreſentation of this Stone in its 1st State, as ſuppoſed, and in its 2d state, as actually found.

MEDICAL EXTRACTS.

BEING
A CONCENTRATED VIEW
OF SOME
LATE DISCOVERIES IN CHEMISTRY,
AND THE
NEW THEORY AND PRACTICE OF PHYSIC,
THEREBY INTRODUCED.

BY

A FRIEND TO IMPROVEMENTS.

There are three things which almoſt every perſon gives himſelf credit for underſtanding, whether he has taken any pains to make himſelf maſter of them or not. Theſe are, 1. The art of mending a dull fire: 2. Politics: and, 3. *Phyſic.* FROM Dr. BEDDOES'S GUIDE TO PARENTAL AFFECTION.

LONDON:
Printed for ROBINSON, Paternoſter-Row:
And ſold by JOHNSON, St. Paul's Church-yard; DILLY, in the Poultry;
MURRAY, Fleet-ſtreet; OWEN, Piccadilly, oppoſite Bond-ſtreet;
and COX, St. Thomas's-ſtreet, Borough.

1794.

WELLCOME INSTITUTE LIBRARY

TO

SIR JOSEPH BANKS, BART.

Preſident of the Royal Society, &c. &c. &c.

SIR,

As a Patron of the Liberal Sciences, and more eſpecially, from the native benevolence of your diſpoſition, as the favourer, of every attempt that may tend to alleviate the afflictions of mankind, this work is humbly offered to your notice.

It places in a concentrated view, the late diſcoveries in chemiſtry, and the new theory and practice of phyſic.

The late Dr. HUNTER ventured to propheſy, *that if ever* THE OFFICE OF THE LUNGS *ſhould be diſcovered, there would ariſe a great and ſudden improvement in the ſcience of medicine.*

This diſcovery, Sir, has been made, to the honour of the 18th century, by the fortunate labours of ſeveral philoſophers; and a new doctrine, grounded, in part, upon the knowledge of *the office of the lungs*, and *the agency of oxygen air in the ſyſtem*, is inſtituted by Dr. BEDDOES, the learned and ingenious Profeſſor of Chemiſtry at OXFORD, which unfolds the cauſes of many hitherto perplexing diſorders, and at the ſame time ſuggeſts to the enlightened practitioner a rational and improved mode of treatment.

Though no open objections were made to this new improvement in the ſcience of medicine by any phyſician, yet ſome inſinuations appear to have been early thrown out, complimentary indeed to the ingenuity of Dr. BEDDOES, but exhibiting a ſtrong prejudice againſt any alteration even in the unſucceſsful routine of practice.

Theſe attempts only ſerved to call forth the pens of men of the higheſt reſpectability, and Dr. DARWIN, Dr. PERCIVAL, Dr. WITHERING, Dr. PARRY, Dr. EWART, Dr. WOOD, Dr. BRIGGS, Dr. THORNTON, and even the pupil and favourite of the late Dr. CULLEN, the Rev. Mr. TOWNSEND, did not heſitate, with the Rev. Mr. CARTWRIGHT, to deliver to the public their unbiaſſed teſtimony in favour of the new practice *.

The office of the lungs being known, and the alteration of the blood from oxygen air, and the influence of oxygenated blood on the nerves and animal œconomy, the ſtudy of phyſic is now become a pleaſing and intereſting purſuit. Nature appears ſublime and ſimple in her operations. The great myſtery of life is laid open to our view, and we are enabled clearly to comprehend, how this wonderful machine of ours depends every moment for its exiſtence on the due ſupply of *oxygen air* to our lungs, diſplaying at once the wiſdom and benevolence of THE ALMIGHTY. Having learnt this intimate connection, we ſee the grounds for the *new practice*; and from the exertions of phyſicians educated in the *new ſchool*, we are led to entertain ſome hopes of ſeeing even thoſe recovered, who have already been deſpaired of by their friends. We are taught, alſo, how to avoid many common and afflicting diſorders incident to the human frame; and, thanks to Dr. BEDDOES, who ſtands confeſſedly the foremoſt of the new ſchool, the way to a prolongation of life and health, comparatively ſpeaking, is made eaſy: —and if the execution of this work has at all correſponded with the intention of the author, perſons of both ſexes, who have the power of fixing their minds for a few hours, and feel themſelves intereſted in the important enquiry, will ſoon be initiated into the new diſcoveries of chemiſtry, and the new theory and practice of phyſic, thereby introduced.

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* Vide the Communications of ſeveral of theſe Gentlemen, as publiſhed by Dr. BEDDOES: alſo Dr. PERCIVAL'S Eſſays; Dr. WOOD'S Cure of Typhus, or Putrid Fever, by Oxygen Air; and the Rev. Mr. TOWNSEND'S Phyſician's Vade Mecum.

The public will ſee theſe new opinions alſo amply vindicated by Dr. DARWIN, in a work of his, which will be publiſhed in a few weeks; and in the Rev. Mr. TOWNSEND'S Guide to Health, now in the preſs. We are alſo in expectation of another work from Dr. BEDDOES on this ſubject.

The labours of many enlightened phyſicians are here preſented in one body, and by notes, and ſome alterations in the text, and a methodical arrangement, it is hoped, they are rendered intelligible even to ſuch as have not been accuſtomed to ſtudies of this kind. As a juſt tribute of reſpect and eſteem,

I have the honour to ſubſcribe myſelf,

Sir,

Yours, &c. &c.

SECT. I.

THE MECHANICAL PROPERTIES OF AIR.

ONE of the firſt things that our ſenſes inform us of, is, that although THE AIR we breathe is too fine for our *ſight*, it is very obvious to our *touch*. Although we cannot *ſee* the *wind* contained in a bladder, we can readily *feel* its reſiſtance; and though the *hurricane* may want *colour*, we often fatally experience that it does not want *force*. So far the ſlighteſt experience reaches; but by carrying experiment a little farther, we learn that *the air* alſo is HEAVY.

A glaſs veſſel being *emptied of its air* and accurately weighed, has been found *lighter* than when it was weighed with the air in it. Upon computing the *ſuperior weight* of the full veſſel, a *cubic foot of air* is found to weigh *rather more than an ounce*.

Again, if the air be exhauſted out of any veſſel, and this veſſel be ſet with the mouth downwards in water, the *water will riſe up* into the empty ſpace, and fill the inverted glaſs; the external air will in this caſe preſs upon the water ſurrounding the glaſs, and force it up into *the vacuum*; and juſt as the beam of a balance *riſes*, the other extremity having a weight on it, ſo will the water *riſe* in the glaſs, and continue *to riſe* (if the empty glaſs were tall enough) 32 FEET, and NO HIGHER *.

Pipes have been made purpoſely above 32 feet high; in which, upon being exhauſted, the water has always riſen to the height of 32 feet: there it has *conſtantly reſted*, and *never aſcended higher* †.

From this fact we learn therefore the EXACT WEIGHT of *the air*, which preſſing up the water 32 feet, is equal to a column of water of that height, as it is juſt able to raiſe ſuch a column, and no more.

In other words, the ſurface of the earth is every where ſurrounded with *a weight of air*, which is *equivalent* to a flood of water 32 feet deep, or to a covering of 29 inches and an half of quickſilver, which is known, though occupying leſs ſpace, to be juſt as heavy as the former ‡.

Thus we ſee that the air at the ſurface of the earth is juſt as heavy as 32 feet of water, or 29 inches and an half of quickſilver; and it is eaſily found that to raiſe water 32 feet, *will require a weight of* 15 *pounds upon every ſquare inch*.

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* It is on this principle that *pumps* raiſe water.

† Pumps, therefore, raiſe water no higher than 32 feet.

‡ *Barometers* which determine the weight of air are conſtructed on this principle.

Now if we are fond of computations, we have only to calculate *how many ſquare inches* are in the *ſurface* of an ordinary human body, and allowing *every inch* to ſuſtain 15 *pounds*, we may amaze ourſelves at the weight of air we ſuſtain.

It has been computed that our *ordinary load*, though from its *equal preſſure* we are not ſenſible of it, *amounts* to within a little of 20,000 *pounds*: this is wonderful! but it is not by wondering we acquire wiſdom.

Notwithſtanding this be our ordinary load, there are at *different times*, as the barometer ſhews †, *ſome variation.*

The air is not equally heavy at all ſeaſons; but ſometimes it is *lighter*, and ſometimes *more heavy.* This, therefore, makes a *very great difference* in the weight we ſuſtain; and we are actually known, by computation, to carry at one time 4000 pounds of air more than at another.

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† When the barometer *riſes*, a greater weight of air preſſes up the mercury in the tube, and the clouds uſually aſcend; when the barometer *ſinks*, the weight of incumbent air being leſs, the clouds gravitate below. Hence the *variations* of the barometer denote the *changes* of the weather. The effects of a *moiſt* or *dry* air, and the viciſſitudes of *cold* and *hot* winds on the animal body, will be conſidered afterwards.

Again,

Again, as in the ſea, a man at the depth of 20 feet, ſuſtains a greater weight of water than a man at the depth of but 10 feet; ſo will a man at the bottom of a deep valley have a greater weight of air over him, than a man at the top of a very high mountain [*].

Our conſtitutions ſeem alſo to correſpond with theſe changes; they are braced, ſtrong, and vigorous, with a *large body of air* upon them;—they are languid, relaxed, and feeble, when *the air is light*, and refuſes to give our fibres their proper tone.

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[*] The art of taking the heights of mountains by the barometer determines this curious point. As the air grows *lighter* the higher we aſcend, the fluid in the tube will *ſink* alſo in due proportion. It is found to *fall* at the rate of the tenth part of an inch for every 90 feet; ſo that in going up a mountain, if the quickſilver has fallen *an inch*, I conclude I am got up an aſcent of near 900 *feet*. GOLDSMITH.

SECT. II.

THE CHEMICAL PROPERTIES OF AIR.

FORTUNATELY for my readers, the chemical knowledge neceſſary firſt to be learnt in order *clearly* to underſtand the INFLUENCE of the AIR on the BLOOD, and THENCE on the ANIMAL ECONOMY, compriſes the *moſt beautiful diſcoveries* in that ſcience; *diſcoveries* that have done honour to this age, and have immortalized the names of PRIESTLEY, LAVOISIER, FOURCROY, and CAVENDISH.

The Honourable Mr. BOYLE has conſidered OUR ATMOSPHERE as *one large chemical veſſel*, in which an infinite number of various operations are conſtantly performing. In it all the bodies of the earth are continually ſending up a part of their ſubſtance, by evaporation, to mix in *this great alembic*, and to float a while in common. Here minerals from their loweſt depths aſcend in noxious vapours to make a part of the general maſs; ſeas, rivers, and ſubterraneous ſprings, furniſh their copious ſupplies; plants receive and return their ſhare; and animals that by living upon conſume this general ſtore, are found to give it back in vaſt quantities when they die.

THE AIR, therefore, which every where preſſes on us, and upon which we ſubſiſt, bears very little reſemblance to that *pure*, *ſimple*, *elementary body* formerly imagined; and which is rather a ſubſtance that can be conceived, than experienced to exiſt.

MODERN CHEMISTRY, however, has made great advances in *this curious reſearch*, and it will ſoon appear that the compoſition of atmoſpherical air has been more *rigorouſly* determined.

Chemiſtry affords two general methods of aſcertaining the conſtituent principles of bodies, the method of ANALYSIS[*], and that of SYNTHESIS[†].

When, for inſtance, by combining *water* with *alkohol*, we form the ſpecies of liquor called BRANDY, we certainly have a right to conclude (by this ſyntheſis) that BRANDY is compoſed of *alkohol* and *water*.

And when by diſtillation of BRANDY, we obtain ſeparate, *water*, and *alkohol* (by this analyſis), our evidence of the conſtituent principles of BRANDY is then rendered complete; and in general it ought to be conſidered as *a principle* in chemical ſcience, never to reſt ſatisfied without *both theſe ſpecies of proofs*.

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[*] From the Greek word *αναλυσις*. The *ſeparation* of any *compound* into its *ſeveral parts*.

[†] From the Greek word *συνθεσις*. The *putting together* the *ſeveral parts* of a *compound body*.

THE MODERN ANALYSIS
OF
ATMOSPHERIC AIR;

Or its Separation into { *The* ONE *ſupporting Life and Flame.*
2 ELASTIC FLUIDS, { *The* OTHER *adverſe to both.*

LAVOISIER'S EXPERIMENT.

THIS illuſtrious chemiſt having placed a certain quantity of MERCURY in a *retort*, adapted to a *bell glaſs*, which encloſed 100 *cubical inches* of COMMON AIR, he kept up in his furnace a conſtant fire, of ſuch force, as to keep the QUICKSILVER almoſt always at its *boiling point*.

On the ſecond day ſmall RED PARTICLES began to appear on the ſurface of the MERCURY, which gradually increaſed in ſize and number for 4 or 5 days.

Convinced that the *calcination* of the MERCURY after that time did not go on, he extinguiſhed the fire; and when the veſſel was cool, he found in his bell-glaſs, inſtead of 100 *cubical inches of air*, only 86, and therefore A LOSS of 14 *cubical inches* of AIR.

Now, 14 *cubical inches* of AIR weighs 7 *grains*, and the RED PARTICLES, or CALX OF MERCURY, being carefully collected, *theſe* had an *increaſe of weight* of 7 *grains*, the *exact weight* of AIR which ſeemed LOST *.

The 86 *cubical inches* of AIR remaining in the glaſs after this calcination was ended being examined, it was found to poſſeſs THESE PROPERTIES.

An animal being put into it was *ſuffocated* in a few minutes,—and when *a taper* was plunged into it, it was *extinguiſhed*, as if it had been immerſed in water †.

THIS GAS, or AIR, has been called *phlogiſticated air*, *non-reſpirable air*, *noxious or mephitic air*, *impure air*; but the French chemiſts have preferred the term AZOTIC GAS (*lethal air*) from the Greek words *α*, *privative*; and *ζωη*, *life*.

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* The concluſion is obvious, and in the next experiment, we ſhall find, that the 14 *cubical inches of air*, which was *abſorbed* by the MERCURY, and converted it to a CALX, was the *vital* or *reſpirable part* of air.

† Not from any peculiar properties, but becauſe the *vital* or *reſpirable part* was abſtracted from it.

LAVOISIER'S SECOND EXPERIMENT.

HAVING taken 90 *grains* of the CALX OF MERCURY*, the product of the *laſt proceſs*, LAVOISIER put it into a glaſs retort fitted to a proper apparatus for receiving aerial products.

Having applied a *much ſtronger heat* than in the laſt experiment, he obſerved that at firſt, in proportion as the CALX of MERCURY became heated, the intenſity of its colour augmented; but ſoon after, the CALX began gradually to decreaſe in bulk, and in a few minutes *its red colour altogether diſappeared*, and the CALX was converted into RUNNING MERCURY, and 14 *cubical inches* of an AERIAL FLUID paſſed over into the recipient.

Now theſe 14 *cubical inches* of air weighed 7 *grains*, the *exact weight* of the air *conſumed* by the CALCINATION of the MERCURY in the firſt experiment †; and the calx of mercury REDUCED ‡ to a metallic ſtate being examined, had *loſt in weight 7 grains*, the *exact weight* of the air obtained. THIS AIR poſſeſſed theſe PECULIAR PROPERTIES.

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* Corroſive ſublimate.

† Had the 100 *cubical inches* of atmoſpheric air contained a larger ſhare of *oxygen* or *vital air*, *more* MERCURY would have been *calcined*. For *calcination*, as this experiment ſhews, is nothing more than the *combination* of *reſpirable air* with *any metallic* body.

‡ From the Latin word REDUCO, *to bring back*. REDUCTION is the bringing back a *metal converted to a calx* to its *priſtine ſtate*.

An animal, being placed in IT, became *remarkably lively*; a *taper* burnt in it with a *dazzling ſplendour*; and *charcoal*, inſtead of conſuming quietly away, as it does in common air, burnt *with a flame*, attended with a decrepitating noiſe, and threw out ſuch a *brilliant light* that the eyes could hardly endure it.

This ſpecies of air was diſcovered almoſt at the ſame time by Dr. PRIESTLEY, Mr. SCHEELE, and LAVOISIER. Dr. PRIESTLEY* gave it the name of *Dephlogiſticated* or *Pure Air*; Mr. SCHEELE called it *Empyreal Air*; and LAVOISIER firſt named it *Highly reſpirable Air*, or *Vital Air*; and afterwards, as it forms acids, by combining with certain bodies, the French chemiſts adopted the term OXYGEN GAS *(Acid-making Air)*, from the Greek words υξυς, *ſour*; and γεινομαι, *to beget*[*].

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* Dr. PRIESTLEY is, however, believed to have been the *firſt* who diſcovered this *wonderful aerial gas*, but undoubtedly LAVOISIER was the *firſt* who proved, by direct and exact experiments, that the weight which metals gain by *calcination* correſponds with that of the air which they abſorb; he was the *firſt* who publiſhed that the atmoſphere conſiſts of *two diſtinct fluids*, the *one* fit for the purpoſes of reſpiration and combuſtion, which he therefore called VITAL, or PURE AIR; the *other* unfit for either purpoſe, and thence called FOUL, or MEPHITIC AIR; he *firſt* proved that PURE VITAL AIR contained more FIRE, or CALORIC, than any other air; and that during combuſtion, as this air, or rather its *baſe*, was uniting to the ſubſtance, and adding its weight to the burning body, it gave out THIS FIRE in the form of HEAT and LIGHT. *Kirwan.*

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[*] If *ſulphur* or *charcoal* be burnt in *oxygen* or *vital air*, in a cloſe veſſel, and the fumes be condenſed in water, *this water* will acquire an ACID TASTE, and be increaſed *in weight* exactly *correſponding* to the *weights* of *ſulphur* or *charcoal* conſumed, and *that* of the *oxygen air* deſtroyed. *Sulphur* united thus with *oxygen*, the fumes being collected in water, will form VITRIOLIC ACID; and *charcoal* combined with *oxygen*, and diffuſed in water, will form SELTZAR, or the AERIAL ACID WATER. The *calces* of metals the French chemiſts call OXYDS, which ſignifies a body impregnated with a *certain quantity* of *oxygen*, but not *ſufficient* to render it *perceptibly acid*.

THE SYNTHESIS.

LAVOISIER then repeated the ſame experiments as before related, and *re-combined* the 2 ELASTIC FLUIDS, which he had ſeparately obtained in the two experiments of *calcination* and *reduction*, viz. the 84 *cubical inches* of the AZOTIC AIR, and the 14 *cubical inches* of the OXYGEN AIR, and he produced from *this combination* an ELASTIC FLUID *preciſely ſimilar in all its properties to* ATMOSPHERIC AIR, contributing in the ſame way to a repetition of the ſame experiments, and poſſeſſing the ſame power of ſupporting animal life and combuſtion.

The philoſopher can have no remaining doubt as to the *compoſition* of ATMOSPHERIC AIR: but the circumſtances of theſe experiments might appear to him *more correct*, though probably at the time *leſs clear* to others, were it ſaid, that MERCURY, at a certain temperature, overcoming the affinities * of *caloric* † and *azotic air* for

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* If you take a bullet and divide it with a knife into *two parts*, provided theſe be ſmooth and rubbed together, they will ſtrongly unite and form *one whole*. This is from a law impreſſed on matter called the *attraction of coheſion*. But ſhould a particle of ſand, or any roughneſs exiſt, the particles being divorced

† *Fire*, or the *matter of heat*.

OXYGEN, attracts and fixes within itſelf OXYGEN[*], (the *baſe* of oxygen air, for oxygen air is oxygen combined with a certain quantity of caloric :)—hence its *increaſe of weight*, and its *converſion into an oxyd or calx*, and hence the AZOTIC, or LETHAL, AIR *left us* in the bell-glaſs.—That, the temperature being increaſed[†], the affinity of

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divorced from each other, beyond the *ſphere of mutual attraction*, they are no longer actuated by this law.—*The attraction of coheſion* in *mercury*, at the common temperature, hinders the admiſſion of OXYGEN, for which it has an *elective attraction* or *affinity*. But when expoſed to a ſtrong heat, the *caloric* expands this fluid ; that is, inſinuates itſelf through the body, and ſeparates its particles (thermometers depend on this expanſive power of fire), and, like the pieces of the bullet where ſand interpoſed, the divided particles are no longer ſubject to the *law of coheſion* ; then it is they obey the *law of attraction*, and each atom of MERCURY *attracts to itſelf* a particle of OXYGEN, juſt as a loadſtone would draw to itſelf a particle of iron.—The loadſtone *only attracts* iron. This repreſents the term *affinity* in chemiſtry. The mercury did not attract the AZOT, becauſe chemiſts would ſay it had no *affinity* for it.

[*] An experimentaliſt would illuſtrate this by placing a NEEDLE between *two magnets* of different powers. This would repreſent OXYGEN between the two attractions of the *caloric* and *azotic air*. As we may ſuppoſe a *loadſtone* to have an attraction for the NEEDLE ſuperior to the *two magnets*, ſo would it draw THE NEEDLE to itſelf from *theſe*, juſt as the *mercury* draws away from the *azotic air* and *caloric*, the OXYGEN.

[†] This is a curious fact ; the temperature being increaſed, the CALORIC *alone* overcomes the elective attraction of *mercury* for *oxygen*, and depriving it of *that principle*, the *attraction of coheſion* takes place with the particles of *mercury*, and we obtain then RUNNING MERCURY and OXYGEN GAS. To have recourſe to the note on page 12, the *oxygen* and *mercury* being ſeparated beyond their *ſphere of attraction*, the *caloric* attracts to itſelf the *oxygen*, juſt as either of the *magnets* (in the preceding note) would again attract to itſelf the NEEDLE, were it placed within its *ſphere of attraction*, but *beyond that* of the *loadſtone*.

the *caloric* for OXYGEN becoming now ſuperior to the attraction of the MERCURY, the OXYGEN is withdrawn from the OXYD OF MERCURY by the ſuperior attraction of the *caloric*;—hence its *decreaſe in weight*, and its *reſtoration to fluidity and ſplendour*, and hence the produce of OXYGEN, or VITAL, AIR, clearly diſplaying to us this important truth,

“ THAT ATMOSPHERIC AIR IS ACTUALLY A
“ COMPOUND OF TWO HEAVY SUBSTANCES, AZOT *
“ AND OXYGEN; WHICH BODIES, WHEN COMBINED
“ WITH CALORIC, OR THE MATTER OF HEAT, BE-
“ COME AERIFORM, AND ARE THEN AZOTIC AND
“ OXYGEN AIRS.”

Although theſe experiments furniſh us with a very ſimple means of obtaining, ſeparate from each other, the two elaſtic fluids which compoſe our atmoſphere, yet do they not give us an exact idea of *the proportion* in which *theſe two* enter *its compoſition* [*]. For the attraction of the MERCURY for OXYGEN is not ſufficiently ſtrong to overcome all the circumſtances which oppoſe this union, ſuch as the mutual adheſion of the *oxygen* and *azotic airs*, and the ſtrong affinity which unites *oxygen* to *caloric*, in conſequence of theſe, though the OXYGEN is torn by the MERCURY from its union with the *azotic air* and *the caloric*, yet towards the end, when the *azotic air* is more abundant, there will ſtill remain ſome portion of the *oxygenous principle*, combined with the *azotic air*, which the MERCURY could not ſeparate.

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* That AZOT is a *ſolid ſubſtance* as well as OXYGEN, can be eaſily proved by experiment. That the application of heat ſhould render *oxygen*, and *azot*, *gaſeous* is not wonderful, ſince we often obſerve *ice* by the admixture of *caloric* rendered a *fluid*, and heated to 212, converted into an aeriform and tranſparent gas. The hardeſt ſubſtance in the world, the DIAMOND, may be volatilized in the ſame way. Mon. D'Arcet took a ſphere of porcelain china, and after cutting it into halves, confined a *diamond* in the middle; he then joined the two ſections ſtrongly together. Putting theſe balls into a furnace, he afterwards unſcrewed them, and found the diamonds evaporated, and the place which they occupied empty, though he could perceive no chink or fracture any where over the ſurface of the ball!

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[*] In our climate the proportion generally is 4 of *azotic air* to 1 of *oxygen air*, as will be hereafter proved.

THE ANALYSIS OF OXYGEN AIR.

THAT OXYGEN GAS, is compoſed of OXYGEN, HEAT, & LIGHT, will be *evident* from the following very elegant experiment made by Dr. INGENHOUST.

A fine *iron wire*, twiſted into a ſpiral *, being heated at its extremity red hot, and thruſt into a jar containing only *oxygen air*, it inſtantly took fire, and burnt away rapidly†, exhibiting a bright light ſimilar to that of Chineſe fire-works, and throwing out brilliant ſparks, which fell to the bottom in the form of round globules ‡.

At the beginning of the combuſtion there is a ſlight augmentation in the volume of the air in the bell-glaſs, from the dilatation cauſed by the heat; but preſently

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[*] This was done to render the experiment more ſtriking.

[†] This experiment ſhews that *azotic air* retards the union of *oxygen* with bodies attracting it, and in ſome caſes altogether prevents it.

[‡] Theſe were found floating on the mercury, and are natural *Martial Æthiops.* How much ſlower is the *calcination* or *ruſting* of *iron* in other circumſtances!

after a *rapid diminution* takes place, and *the mercury riſes in the glaſs*, inſomuch that when the *quantity of iron is ſufficient*, and the AIR *operated on is very pure*, almoſt the *whole air employed* is *abſorbed**,—or ſhould the *quantity of* IRON *be inſufficient*, the REMAINING AIR *unabſorbed* will be found PERFECTLY PURE†.

The *theory* of this experiment is the ſame as the laſt. At a certain temperature IRON has a *ſtronger affinity* for the OXYGEN, than CALORIC and LIGHT have. IT *therefore* attracts to itſelf the OXYGEN, and CALORIC and LIGHT becoming diſengaged ‡, are rendered *active* and *evident* to the ſenſes.

Previous

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* That is, if 100 *grains* of IRON be conſumed in 70 *cubic inches* of *oxygen air*, the whole volume of air will diſappear; and as 70 *cubic inches* of *oxygen air* weigh 35 grains, the 100 *grains* of *iron* will weigh, in its ſtate of *oxyd* or *calx*, 135 grains.

† As the *pure* or *oxygen air* is found unaltered, the *mephitic air* left us in the *calcination of the mercury* could ariſe only from the *abſtraction* of the *oxygen air*. Vide Experiment the Firſt, p. 8. Note *.

‡ As the calcination of the *mercury*, in the firſt experiment, laſted ſeveral days, the *diſengagement* of CALORIC and LIGHT was extremely ſmall for each particular moment of time, and therefore not perceptible to the ſight. The heat, alſo, of the furnace was confounded with it, which made it neceſſary to relate the experiment above, where *the combuſtion* of the metal was more rapid, or rather *the decompoſition* of the OXYGEN GAS.

When we are ſailing on the water in a ſtill day, *diſtant objects appear to meet us*, but our reaſon corrects the deluſion. When we behold the ſun, moving from eaſt to weſt, philoſophy again aſſumes its empire, and we are convinced

Previous to our entering upon the ſubject of the effects of air on the animal economy, it will be neceſſary to ſhew, alſo, that WATER, though it be the ſolvent of a vaſt variety of bodies, is neither that *compound* or *ſimple element* formerly ſuppoſed, but made up of two VERY DISTINCT and DIFFERENT PRINCIPLES.

The new and beautiful doctrine of the French chemiſts, reſpecting the compoſition of air, the nature of combuſtion, calcination, &c. was daily gaining ground, and obtaining the applauſe of every one, when an experiment performed by Dr. PRIESTLEY made it for a while totter on its baſis.

In the middle of a long glaſs tube this excellent experimentaliſt put ſome CALCINED LEAD, and affixed to the extremities *bladders* which were filled with INFLAM-

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it is *ſtationary*. If we take a PRISM, it diſplays to us a variety of colours; our reaſon tells us here alſo, that *theſe colours* ariſe from the RAYS OF LIGHT, and are not *in* THE PRISM,—ſo of the combuſtion of bodies, the *caloric* and *light* are not from THE WAX of our candles, but from the OXYGEN AIR, which, as we have ſeen in this experiment, becomes, under certain circumſtances, *decompoſed*. Vide alſo the latter part of note ‡, page 24.

MABLE AIR*. Having applied a ſtrong heat to the middle of this tube, he next ſqueezed the bladders, and forced the INFLAMMABLE AIR along the tube.

The INFLAMMABLE AIR ſoon diſappeared: no OXYGEN GAS was evolved: but the RED LEAD quickly *reaſſumed* its original metallic ſplendour.

A queſtion then aroſe, whence *this property* in INFLAMMABLE AIR which the ANTIPHLOGISTIANS would aſcribe to the evolution of OXYGEN GAS.

The favourers of the NEW SYSTEM were not able to deny the fact; and as the INFLAMMABLE AIR, which was now called PHLOGISTON, had in this experiment *diſappeared*, they found ſome difficulty to perſuade *the ſupporters of the* OLD DOCTRINE that the *revival of the metal* could not be from the *abſorption* of the INFLAMMABLE AIR, as the RED LEAD had *loſt* a good deal of its *weight*,

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* *This air* Dr. PRIESTLEY obtained from *diluted* vitriolic acid poured on iron. *Iron* was therefore ſaid to contain a great quantity of *this air*. But the fact will ſoon appear that the air aroſe from *the decompoſition of the water* mixed with the vitriolic acid. INFLAMMABLE or HYDROGEN AIR, being 15 times lighter than common air, it is employed for balloons.

Inflammable air quickly deſtroys life, whereas *oxygen gas* appears to be the very principle of life. *It* is conſiderably lighter than either *oxygen* or *common air*. *It* explodes when it comes into contact with *common air*, but more eſpecially with *oxygen air*, provided any body in actual inflammation be preſent.

and

and the *effect* of an *addition of matter* (if *inflammable air* be *matter*) could be no other than to give it *an increaſe* of *weight*.

Fortunately for chemiſtry the Honourable Mr. CAVENDISH, by paſſing an electric ſhock through *oxygen air* blended with *inflammable air* †, produced WATER. *The reduction* of the RED LEAD in Dr. PRIESTLEY's experiment was then no longer a matter of ſurpriſe. At a *certain temperature* the INFLAMMABLE AIR overcoming the attraction of the *lead* for OXYGEN divorced it of *that principle*, and uniting with it formed WATER.

But that no doubt may be entertained on this head, I muſt beg leave to relate an experiment which was performed by MEUSNIER before a large aſſembly of the Academy of Sciences at Paris.

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† 85 grains, by weight, of *oxygen air*, and 15 grains of *inflammable* or *hydrogen air*, produced here preciſely 100 grains of WATER. In this experiment *caloric* is diſengaged, and the 85 parts of *oxygen* and 15 of *hydrogen* unite, which, being naturally *ſolid ſubſtances of themſelves*, become, if nearly all the *caloric* be extracted from them, ICE; if leſs, WATER.

THE ANALYSIS OF WATER;

Or its ſeparation into its 2 CONSTITUENT PARTS, { HYDROGEN, and OXYGEN.

MEUSNIER'S FAMOUS EXPERIMENT.

HE took a GUN-BARREL, into which he put ſome thick pieces of IRON-WIRE flattened by the hammer. He *weighed* the whole with a ſcrupulous exactneſs. He then *luted* the gun-barrel to ſecure it from the immediate contact of the fire. It was then placed in *a furnace*, but ſo *inclined* that water would readily glide down it. He adapted to the upper extremity a *funnel* containing water, from which it could not eſcape into the gun-barrel but drop by drop. This funnel was *cloſed at the top* to avoid any the leaſt evaporation of the water. At the lower extremity *veſſels* were adapted to receive any aerial product. To uſe every precaution *theſe* were exhauſted of their air.

The *gun-barrel* was now made red hot, and the WATER from the funnel paſſed into it drop by drop.

An aſtoniſhing quantity of INFLAMMABLE AIR* was quickly obtained.

Having removed the luting, the *gun-barrel* with its *contents* weighed conſiderably *heavier* than *before*; and *the acquired weight* of the gun-barrel being *added* to the *weight* of the *inflammable air* thus produced, was *preciſely* the *weight* of the WATER *expended* in the proceſs: and the IRON-WIRE found in the barrel (the proceſs being over) reſembled in every reſpect *iron* that has been conſumed in *oxygen air*, that is, it was become an OXYD † OF IRON.

Before we enter upon the main object of this work, it will be neceſſary alſo to give the analyſis of FIXED AIR.

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* This INFLAMMABLE AIR was generated from the *hydrogen* of the water, which united with the *caloric* of the furnace in its paſſage through the barrel. INFLAMMABLE AIR the French chemiſts call HYDROGEN GAS, from the Greek words *υδωρ* water, and *γεινομαι* to beget.

† A CALX, which accounts for the *oxygen*, the other conſtituent principle of WATER.

THE ANALYSIS
OF
CARBONIC ACID AIR, OR FIXED AIR;

Or its Separation into its { CHARCOAL, and
2 CONSTITUENT PARTS, { OXYGEN AIR.

MR. TENANT, of Emanuel College, Cambridge, having procured a glaſs tube hermetically ſealed at one end, luted it over with clay and ſand to prevent the ſudden action of the fire. He then introduced into it ſome PHOSPHORUS and powdered MARBLE*, and having cloſed the open extremity, he applied to the tube a quick heat, and the reſult was, when cold,

1. PHOSPHORIC ACID † combined with *calcareous earth.*

2. PHOSPHORUS combined with the *ſame earth.* And

3. A BLACK SUBSTANCE, which differed in nothing from CHARCOAL made from vegetables.

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* If *vitriolic acid* be poured on *marble*, FIXED AIR is given out in great abundance. Mr. Tenant therefore aſſumes this data, *that marble contains* FIXED AIR. As the reſidue is *vitriolic acid* and CALCAREOUS EARTH, *marble* is known alſo to contain CALCAREOUS EARTH.

† *Phoſphorus* and *oxygen.* The anſwer to this natural queſtion, *Whence this oxygen?* is clearly demonſtrated over leaf.

If VITRIOLIC ACID * be poured on MARBLE, THIS ACID poſſeſſing a ſuperior power of combination or attraction for the *calcareous earth* of the marble, than the *carbonic acid* † has, it unites with the *calcareous earth*, and the *carbonic acid*, becoming diſengaged, attracts to itſelf *caloric* ‡, and eſcapes in the form of *gas* ‖.

MARBLE is therefore a compound of 3 *bodies*,
- OXYGEN, combined with
- CHARCOAL, or *the carbonic acid*; and
- CALCAREOUS EARTH.

The *theory of this experiment* will be now eaſily underſtood.

At a certain temperature PHOSPHORUS (which is a ſimple body) overcoming the attraction of the *charcoal* for *oxygen*, deprives the CARBONIC ACID of its *oxygen*, and becomes, in conſequence,

1. PHOSPHORIC ACID §, which unites with the *calcareous earth*.

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[*] *Sulphur* and *oxygen*.

[†] *Charcoal* and *oxygen*. FIXED AIR is *charcoal*, *oxygen*, and CALORIC.

[‡] The CALORIC proceeds in part from the *vitriolic acid*; which acid, if poured on *water*, will almoſt make it *boiling hot*, to the no ſmall aſtoniſhment of perſons unacquainted with chemical operations. Since *two cold bodies*, coming into contact with each other, give out *heat*, CALORIC, we ſee, may be in a *dormant* or *neutralized ſtate*.

[‖] Viz. CARBONIC ACID GAS, or FIXED AIR; which is *charcoal* (carbon), *oxygen*, and a certain quantity of *caloric*. Vide p. 23, Note *.

[§] *Phoſphorus* and *oxygen*.

The *phoſphoric acid* being *ſaturated* * with the *calcareous earth*, we have alſo,

2. PHOSPHORUS united with *calcareous earth.* And,

3. The CHARCOAL of the marble is left us in its *ſimple ſtate* †.

The proof, by ſyntheſis, that the conſtituent principles of FIXED AIR ‡, are *charcoal*, and *oxygen* AIR, is more beautiful, as being eaſier underſtood. See over leaf.

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[*] If *diluted vitriolic acid* be poured on marble, an effervefcence denoting the extrication of *fixed air* is ſeen; when the union of the *vitriolic acid* and *calcareous earth* is *complete*, it is ſaid to be SATURATED, the effervefcence now ceaſing.

[†] The OXYGEN, with which it was before combined, being ſeparated from it, by the *ſuperior attraction* of the PHOSPHORUS.

[‡] We owe our firſt knowledge of FIXED AIR to Dr. BLACK, but that *water* abſorbed *this air* upon agitation, and was made Seltzer or Pyrmont water, and that if *iron filings* be put into *this acidulated water*, it became a *chalybeate*, we are indebted to the happy induſtry of Dr. PRIESTLEY.

The reader may, from the above account, doubt whether MARBLE contains FIXED AIR (*charcoal*, *oxygen*, and *caloric*), or only the CARBONIC ACID (*charcoal* and *oxygen*). We ſee, indeed, *water* abſorbing a large bulk of FIXED AIR. But does not ſome portion of its *caloric* paſs into the *cold water*, and hence the condenſation (if I may be allowed the expreſſion) of the FIXED AIR; for if a ſmall heat be applied to the *aeriated water*, it parts with its FIXED AIR. The ſubject is yet ſomewhat obſcure. If *ſulphur* be burnt in *oxygen air* (*oxygen* and *caloric*), VITRIOLIC ACID is gradually formed from the combination of the *ſulphur* with the *oxygen*, and the *caloric* is diſengaged. If *hydrogen* or *inflammable air* be burnt in *oxygen air*, the combination of the

THE SYNTHESIS.

THIS CHARCOAL* Mr. TENANT then burnt in *oxygen air*, which was converted into an ACID GAS, whoſe *weight* equalled the ſum of the *weights* of the *charcoal* which had been burnt, and the *oxygen air* employed †.

THIS ACID GAS had all the *properties* of FIXED AIR. It was readily upon agitation *imbibed by water*, which acquired the ſparkling appearance and taſte of Pyrmont and Seltzer water. *This acidulated water* diſſolved iron filings, and became a perfect chalybeate water. THIS AIR weighed *heavier* than *common air*. A *candle* being put in it, was quickly *extinguiſhed*, and *an animal* died *convulſed in it*.

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hydrogen with the *oxygen* is very rapid, and WATER is formed, and *the caloric* is ſuddenly diſengaged: but if VITRIOLIC ACID be poured on WATER, a conſiderable quantity of *caloric* is then *alſo* diſengaged, which ſeems to prove, that *in the condenſation of airs*, on their change into ſolid ſubſtances, only a *portion* of their CALORIC is diſengaged.

* ANY CHARCOAL would have had the ſame effect.

† FIXED AIR, or the CARBONIC ACID AIR, is compoſed of 28 parts of *charcoal* to 72 of *oxygen air*; or, in other words, 144 cubic inches of *that air* will ſaturate or take up 28 grains of *charcoal*.

THE ANALYSIS

OF

ADEPS, OR ANIMAL FAT;

Or its ſeparation into its 2 CONSTITUENT PARTS, { HYDROGEN, and CHARCOAL.

Animal substances give the ſame products in diſtillation as the *cruciform* * tribe of plants, viz.

ELEMENTS.

	1.	2.	3.	4.	5.
1. Water, - -	*oxygen,*	& *hydrogen,*	- -		
2. Oil, - - -	- -	*hydrogen,*	& *charcoal.*		
3. Carbonic acid,	*oxygen,*	- -	& *charcoal.*		
4. Charcoal, -	- -	- -	- -		
5. Phosphorated charcoal, -	- -	- -	*charcoal,*	& *phoſphorus.*	
6. Ammoniac, -	- -	*hydrogen,*	- -	- -	& *Azot.*

But as theſe ſubſtances contain more *hydrogen* and *azot* than ſuch vegetables, they therefore produce a greater quantity of oil and ammoniac.

That

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* From moſt vegetable ſubſtances, excepting the cruciform plants, we obtain, by ſlow diſtillation,

FIRST EXPERIMENT.

ELEMENTS.

	1.	2.	3.
1. WATER, - -	*oxygen,*	& *hydrogen.*	
2. OIL, - - -	- -	*hydrogen,*	& *charcoal* (as will be proved).
3. CARBONIC ACID,	*oxygen,*	- -	& *charcoal.*
4. CHARCOAL.			

or, in other words, we obtain WATER acidulated with CARBONIC ACID, on the ſurface of which floats ESSENTIAL OIL,—and there remains in the retort unvolatalized by *caloric*, CARBON or CHARCOAL.

But had the heat at firſt been conſiderable in the furnace, we ſhould have had *from the ſame materials*, inſtead of WATER,

SECOND EXPERIMENT.

ELEMENTS.

	1.	2.	3.	4. From the furnace.
1. CARBONIC ACID GAS,	*oxygen,*	- -	*charcoal,*	& *caloric.*

The *oxygen* under theſe circumſtances has a greater affinity for *carbon* than for *hydrogen*. And inſtead of OIL,

	1.	2.	3.	4.
2. HYDROGEN GAS, -	- -	*hydrogen,*	- -	& *caloric.*

The *hydrogen* having in this caſe a greater affinity for *caloric* than for *charcoal*. And,

3. CHARCOAL.

It is an axiom in chemiſtry, that in all its operations nothing is *created*, but only a new *arrangement of parts* takes place: for *the quantity of matter* ſtill remains the ſame after every proceſs.

In the SECOND EXPERIMENT we have ſeen *vegetable matter* reduced to *its primeval elements*, HYDROGEN, OXYGEN, and CHARCOAL. If we carefully aſcertain the quantity of HYDROGEN and CHARCOAL produced in the firſt experiment, and *compare this quantity* with the quantity of HYDROGEN and CHARCOAL produced in the ſecond experiment, we ſhall find a *loſs* or *deficiency* of theſe *two ſimple elements* in the produce of the FIRST EXPERIMENT, which correſponds exactly with *the weight* of the OIL.

VEGETABLE OIL is compoſed therefore of *hydrogen* and *charcoal*.

I cannot

That ANIMAL OIL or ADEPS is compoſed, like VEGETABLE OIL, of *charcoal* and *hydrogen*, will appear evident from the following *analyſis*, or ſeparation of ANIMAL OIL into its conſtituent principles.

In the firſt rectification of *animal oil* a ſmall quantity of WATER is formed by the union of the *oxygen* contained in the air of the diſtilling veſſel, and the *hydrogen* of the oil. We can at length, by frequent diſtillations, decompoſe the *whole oil*, and convert it into WATER *(oxygen* and *hydrogen)* and CHARCOAL, and the weights of the CHARCOAL and WATER will be found exactly correſponding with thoſe of the OIL and the OXYGEN AIR conſumed.

I cannot help here obſerving the uſe that vegetation is of to animal life as firſt diſcovered by Dr. INGENHOUST, in furniſhing the atmoſphere during the day with abundance of VITAL or OXYGEN AIR. Dr. PRIESTLEY's experiments likewiſe prove that vegetables abſorb the NOXIOUS AIR *(fixed air)* produced from combuſtion, reſpiration, and putrefaction; for which diſcovery he received the thanks of the Royal Society.

Dr. FRANKLIN, in writing to this illuſtrious experimentaliſt, ſays, "That the *vegetable creation* ſhould reſtore the air, which has been ſpoilt by the *animal part of it*, looks like a rational ſyſtem, and ſeems to be of a piece with the reſt." Having obſerved the rapid increaſe that plants had in *air fatal* to animals (fixed air), he adds, "This ſeems to prove that ſomething is taken from the air."

It now appears that the veſſels on the under ſurface of leaves abſorb WATER from the air, which paſſing along the capillary tubes of the ſuperior ſurface, by the action of the *ſun*, and the influence of *light*, becomes decompoſed, and the HYDROGEN of the *water* unites with the *ſubſtance* of the plant as one of its principles, while the ſuperabundant OXYGEN is thrown out in the form of the PUREST VITAL, or OXYGEN GAS.

But ſhould the reader have any remaining doubts on this ſubject, he will be convinced by the peruſal of the following *curious account.*

By an arrêt from government *the burying ground* of the INNOCENTS at PARIS, which had been the common receptacle of a great part of the dead of that city for *many centuries*, was directed to be removed. It was compoſed of different burying-places. This name was given to excavations about 30 feet deep, and 20 in breadth, dug in the cemetery of the Innocents, in which were placed in tiers the bodies of the poor, incloſed in their coffins. The neceſſity they were under of aggregating together a great number, obliged the men employed in this buſineſs to place the coffins ſo near to each other, that theſe graves may be conceived as filled with a maſs of dead bodies, ſeparated from each other only by ſlight boards. Each of theſe graves contained about 1500 bodies. When full, the laſt row was covered with about a foot of earth, and a new cavity was opened at ſome diſtance. Each cavity was filled in about three years. The number of the dead, relative to the extent of the church-yard, regulated the *re-opening* of the *ſame ground* at periods of various extent. The ſhorteſt time, however, before an opening was made in the ſame ſpot was 15 *years*. Experience had taught theſe grave-diggers that *this period* was not ſufficient for the total deſtruction of the bodies, whilſt it made them acquainted with the change which we are about to deſcribe.

The opening which the *French chemiſts* ordered to be firſt made, was that of a grave which had been filled and cloſed up for near 15 years. On raiſing the covers of ſome of the coffins, which were in perfect preſervation, we ſaw, ſay they, the bodies enveloped in linen, which marked out the ſhapes of the different regions; but when theſe were lifted up, there was preſented to us nothing but *ſhapeleſs irregular maſſes of a ſoft, ductile, whitiſh ſubſtance.*

Theſe maſſes every where ſurrounded the bones. They poſſeſſed little ſolidity, and yielded to preſſure. This ſubſtance had no unpleaſant ſmell. The grave-diggers had not the ſmalleſt repugnance to handle it, and they called this ſubſtance, which ſo much ſtartled the French philoſophers, by the term FAT.

After examining ſeveral bodies with great attention, they found that all the bodies were not *equally advanced* in this proceſs. In *ſeveral, portions of muſcular fleſh,* diſtinguiſhed by its *fibrous texture* and *reddiſh colour*, were ſtill viſible, amid great maſſes of a WHITE FATTY SUBSTANCE.

In the bodies of women, the exterior part of the cheſt often ſhewed the glandular ſubſtance of the *breaſts*, changed into an homogeneous matter of peculiar whiteneſs, very much reſembling SPERMACETI. The *face* was not recogniſable in the greater number of bodies. The various parts of the *mouth* were not to be diſtinguiſhed. The *jaws*, ſeparate from each other, were ſurrounded with various portions of fat, and lumps of the ſame matter occupied the *cavity of the mouth*. The cartilages of the *noſe* underwent a ſimilar alteration. In the place of *eyes*, the orbits contained only maſſes of fat; and the *ears* were changed in a ſimilar manner. The *hairy ſcalp*, though altered like the other parts, ſtill retained the hair. The *brain* was conſtantly found changed into the ſame ſubſtance as the other organs.

In the *abdomen* there were found irregular maſſes of the ſame fat of various ſizes. In the *thorax* were ſmall pieces of a fatty matter, of a reddiſh colour; and ſometimes there were obſerved irregular round maſſes, which ſeemed to be formed of the fat and fibres of the heart.

The *marrow*, alſo, in the center of the cylindrical bones was wholly converted into a very pure fat; it even inſinuated itſelf between the bony plates, filling up their interſtices.

Although there is no doubt but that the quantity of this matter is larger in the bodies of ſuch as have been fat than in thoſe who have been lean, the facts we have mentioned, prove that other parts, beſides the cellular texture, and fat it contains, are ſuſceptible of this alteration. The following obſervations are deciſive with regard to this point. It is to be preſumed, that the greater number of bodies found in this common grave, were, previous to their death, emaciated by diſeaſe, and in theſe the bodies were found *univerſally* converted into fat, which we cannot ſuppoſe to have had a previous exiſtence.

Our curioſity was ſufficiently rouſed, continue theſe chemiſts, to extend our reſearches into other church-yards. In thoſe where bodies were buried in common graves, we found ſimilar appearances. We met with the fatty matter in a ſufficient variety of cemeteries to convince us, that the formation of this ſingular ſubſtance was by no means peculiar to the ſoil in which we had at firſt obſerved it, but that it takes place every where,

where

where bodies are depoſited in great numbers, cloſe to one another, excluded from the action of external agents, and expoſed ſolely to the effects of their conſtituent principles.

We could obtain no poſitive information relative to what became of the bodies after they have been once changed into fat; the oldeſt and moſt experienced grave-digger knew nothing of this matter.

This converſion of the ſeveral parts of the human body into *true animal fat*, muſt ariſe, ſays Monſ. LAVOISIER, from the diſengagement of AZOT, naturally contained in all animal ſubſtances, leaving behind the *hydrogen* and *carbon*, which are the elements proper for the production of FAT or OIL.

Such are the phenomena taking place during the ſpontaneous diſſolution of bodies buried in the earth; phenomena heretofore equally unknown and undeſcribed, ſo that even words were wanting to convey our ideas. The preſent muſt merely be conſidered as a very imperfect outline of the picture, which poſterity muſt fill up and finiſh. For this purpoſe it will be neceſſary to live among the tombs, to follow up a long and repeated examination of various graves, and beſtow indefatigable attention on the moſt unpleaſant, as well as the moſt melancholy of all purſuits. But even theſe obſervations, which an accident, fortunate for philoſophy, created, deſerve we think a place among the records of uſeful ſcience *.

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* The juſtly celebrated Spaniſh traveller, the Rev. Mr. TOWNSEND, who unites with the accompliſhments of a gentleman, the profoundeſt erudition, has, we have been informed, buried a cow, which died by accident, in a water meadow at PEWSEY. The grave is but ſlightly covered with earth, and a conſtant ſtream of freſh water continually paſſes over it.

Should the reſult be, the total converſion of the muſcular fleſh of this cow into *ſpermaceti*, or the *fatty ſubſtance much reſembling it*, which is expected to take place in about ſix months, we make no doubt, but that the public will be favoured with the theory, and method, of this truly admirable and uſeful experiment.

The *ſpermaceti* formed by this converſion, will be, probably, worth about *four* or *five pounds*.

ON PUTREFACTION;

OR

THE RESOLUTION OF ORGANIZED MATTER INTO ITS CONSTITUENT PRINCIPLES.

PUTREFACTION is the great proceſs appointed by the CREATOR, for the reſolution of animal and vegetable ſubſtances into *the elements* from which they were firſt formed. By this proceſs, the oak and the bramble, the cedar and the hyſſop, fruits, whether delicious, or nutritive, or acrid, or poiſonous, the moſt beautiful of the human ſpecies, and the moſt frightful of the other tribes of animals, are all reduced to one common lot: they finally return back to their original and primeval elements[*].

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[*] WATER and AIR, ſays Sir ISAAC NEWTON, compoſed of old worn particles and fragments of particles, would not be of the ſame *texture* and *nature* now as at the beginning, did not the *primitive particles* of MATTER continue *entire*, and *compoſe bodies* of *one* and the *ſame nature and texture in all ages*. The *changes* of *corporeal things* are to be placed *only* in the *various ſeparations* and *new aſſociations* of *theſe permanent particles*. OPTICS, p. 376.

This reſolution of bodies, when philoſophically conſidered, is equally wonderful with their formation; and is alike governed by *regular* and *invariable laws*. Every plant brings forth its own kind, and every animal its own ſpecies. Theſe live, they are nouriſhed, and ſilently haſten to decay; they paſs back to their *elementary ſtate*, and are *again employed* as the *conſtituent parts* of *other vegetables* and *other animals*. Such, with reſpect to the material part of the creation, is the amazing circle of LIFE and DEATH! A circle in which nature keeps her ſteady rounds, and moves agreeably to laws eſtabliſhed by the ALMIGHTY.

Vegetable ſubſtances which conſiſt of HYDROGEN, OXYGEN, and CARBON, maintain for a long while their organiſed ſtructure, and putrefy with difficulty. Having paſſed through firſt the *vinous* * and then the *acetous*

fermentations,

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* The firſt effect we ſee produced on vegetable ſubſtances which have loſt their VITAL PRINCIPLE, is the deſtruction of the equilibrium, or juſt union of their three conſtituent principles (*hydrogen, oxygen*, and *carbon*), by the action, or operation, of *heat* and *moiſture*. The OXYGEN unites with the CARBON, and the fermenting juice is covered on its ſurface with *carbonic acid gas*. The ſpecific gravity of the liquor is now conſiderably diminiſhed, and if expoſed to diſtillation, it affords a *light inflammable ſubſtance*, called ALKOHOL, or SPIRIT OF WINE: which, as we might reaſonably expect from the volatilization in great part of the *carbon* and *oxygen*, is almoſt entirely made up

of

fermentations [*], they at length become ſubject to the *putrefactive ferment* [†], and the HYDROGEN of the vegetable eſcapes in the form of *hydrogen gas*, while the OXYGEN and CARBON evaporate in the form of *carbonic acid gas*, leaving nothing behind but a ſmall reſiduum of carbon and vegetable earth.

It is different with ſubſtances containing a portion of AZOT. The *equilibrium of parts* is ſoon deſtroyed. Hence it is that animal excrements, which contain, like other animal matters, a quantity of AZOT [‡], are added to the elements, capable of putrefaction, to form compoſts or dunghills.

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of the other vegetable principle, *hydrogen:* for if 8 ounces of SPIRIT OF WINE or ALKOHOL be burnt in a confined apparatus containing only *oxygen gas*, the product will be 9 *ounces* of WATER. The ALKOHOL, having in this caſe increaſed its weight *an ounce*, muſt have attracted *ſomething*, and *this ſomething* can be *nothing elſe* but OXYGEN, the baſe of *oxygen air*, and the CALORIC of the *oxygen air* being diſengaged, is ſeen in its active form during the combuſtion.

[*] This *ſecond ſtage* of ſpontaneous decompoſition, as it is called, is nothing more than the *abſorption* or *imbibing* of OXYGEN from the air.

[†] When the ſpontaneous decompoſition is ſuffered to proceed beyond the *acetous proceſs*, then the *third ſtate*, or PUTREFACTIVE FERMENT, takes place.

[‡] The putrefactive proceſs is moſt eminently perceived in *animal bodies.* Theſe either putrefy immediately; or, if the putrefaction be *preceded* by either of the other ſtages, their duration is too ſhort to be perceived.

The addition of AZOT not only accelerates the putrefactive proceſs, but the *azot* combining with the *hydrogen* affords a new product, which is AMMONIAC or VOLATILE ALKALI*. Monſ. Bertholet has proved, by a variety of experiments, that AMMONIAC is produced by the union of *azot* and *hydrogen*, for if the *azot* in the *animal ſubſtances* be diſengaged by the action of diluted nitrous acid, NO AMMONIAC will be produced, and in all caſes putrifying ſubſtances furniſh AMMONIAC only in proportion to the *azot* they contain.

The following experiment alſo fully proves the compoſition of AMMONIAC.

If AMMONIAC be combined, ſays Monſ. FOURCROY, with a METALLIC OXYD, the *hydrogen* of the AMMONIAC will unite with the *oxygen* of the METALLIC OXYD, and form *water*, whilſt the *metal* is revived, and the *azot*, being left free, will unite with the *caloric* and aſſume the form of a *gas* or *air*.

AMMONIAC has a peculiar penetrating odour. In the putrefaction of animal ſubſtances ſometimes AMMONIAC predominates, which is eaſily perceived by its ſharpneſs

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[*] *This compound* did not naturally exiſt in the animal ſubſtance, but is formed by the combination, in a certain proportion, of two of its conſtituent elements.

upon the eyes, and ſometimes, as in putrid herrings, the PHOSPHORATED HYDROGEN GAS is moſt abundant.

PHOSPHORUS is found in almoſt all animal ſubſtances, and in ſome plants which give indeed a kind of animal analyſis.

It is chiefly to AMMONIAC *(hydrogen* and *azot)* and PHOSPHORUS diſſolved in HYDROGEN GAS, that the fœtor iſſuing from the putrefaction of animal ſubſtances depends. This vapour is highly hurtful to animal life. When accumulated, if the pick-axe of the grave-digger unfortunately ruptures the coffin, it burſts forth, and oftentimes proves fatal to the ſexton, and is ſeen to affect even perſons *at a diſtance* with vertigo, nauſea, and uneaſineſs. May we not conceive, that a poiſon ſufficiently ſubtle to produce the immediate death of many when it firſt eſcapes from the place where it is confined, may even after it is diffuſed in the air retain virulence enough to injure the delicate animal fibre? After having obſerved the conſtant dread that grave-diggers have for this poiſonous vapour, after having ſeen the cadaverous paleneſs of countenance, and other marks of the gradual action of a ſlow poiſon ſo evident in the appearance of *all men employed much in church-yards*, it is impoſſible not to believe that the air in their immediate neighbourhood muſt, in ſome meaſure, injure the health of the inhabitants*.

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* The ſame ſqualid appearance is obſerved alſo in perſons who live in places where animal ſubſtances are allowed to putrefy. Mr. CAREY, in deſcribing the dreadful *fever* which laſt ſummer prevailed in PHILADELPHIA, and ſwept off above 4000 perſons, emphatically ſays, " Shall I be pardoned for paſſing a cenſure on thoſe, whoſe miſtaken zeal led them, during the moſt dreadful ſtages of this calamity, to croud our churches, and aid this frightful enemy in his work of deſtruction? who, fearful leſt his prayers and adorations at home would not find acceptance before the Deity, reſorted to *churches filled with bodies*, where, with every breath, they inhaled a CONTAGIOUS AIR. ' To *this ſingle cauſe* I am bold in aſcribing *a large proportion of the mortality*. I hope," he continues, " the awful leſſon ſome of our congregations hold forth on this ſubject, by a *mortality* out of *all proportion* to their numbers, will ſerve as a MEMENTO at all future times."

This benevolent gentleman would not ſurely wiſh to prevent perſons from aſſembling together, eſpecially in times of calamity, to pay their worſhip to THE SUPREME BEING, from whom every bleſſing that we enjoy flows, and on whom we utterly depend; but he ſhould rather caution us againſt *ſmall* churches, and the abominable practice of *burying the dead* in them, and thus converting *the temples of* GOD literally into *bone houſes*.

The pariſh church of St. LAWRENCE, in the ISLE OF WIGHT, would be crowded, if the congregation conſiſted of more than 20 perſons; with a ſtick of a moderate length you may reach to nearly two thirds of its height. MEETING-HOUSES uſually carry with them the *ſame objection*.

ON CALCULI
AND
THEIR SOLVENTS.

THE celebrated chemiſt Mr. SCHEELE imagines, that all urine, even that of children, contains the conſtituent principles of calculi; but that, in the heat of the human body, theſe are diſſolved, and ſuſpended by ſome unknown acid * menſtruum. On evaporating four cans of freſh urine to two ounces, a fine powder is depoſited as it cools, and a part firmly adheres to the glaſs. Both the *incruſtation* and *precipitated powder* readily diſſolve in a few drops of CAUSTIC FIXED ALKALI; and have, in *other reſpects*, all the properties of calculi.

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* Urine was *formerly* conſidered as an *alkaline* liquor, or lixivium; but Monſ. BARTHOLLET has remarked, that it always contains an exceſs of PHOSPHORIC ACIDS, which *reddens* the tincture of turnſole. This eminent phyſician firſt diſcovered, that the urine of *gouty* perſons contains *leſs acid ſalt* than that of perſons in perfect health; that during the fit of the gout, this fluid is much *more acid than uſual*, though not more ſo than the urine of a robuſt perſon. He conjectures, that in *gouty patients* the PHOSPHORIC ACID is not evacuated by urine, as in healthy perſons; that it wanders, as it were, and is carried into the articulations, where it excites much irritation and pain.

It hath been often obſerved that BILIARY CALCULI are only found in the gall-bladder of *oxen* after dry ſeaſons, and a ſcarcity of freſh fodder, and that they diſappear in the ſpring and autumn, whenever theſe animals are ſupplied with abundance of ſucculent vegetables. Hence theſe ſtones are only to be met with in them, from the month of November to the month of March, and not *afterwards*, which phenomenon ſhews that ſucculent plants have a power of *preventing*, and even *diſſolving*, BILIARY CALCULI, *even after they are formed* *.

Monſ. de MORVEAU thinks that the *chalky matter*, often found in the lungs, and on the different joints of gouty people, which phyſicians have ſuppoſed to be of the ſame nature as the calculus of the bladder, is very *different* from *that ſubſtance*; but he grounds this opinion only on certain experiments of one Whytt, which are far from poſſeſſing the accuracy at preſent required in experimental philoſophy. But from the obſervations of HOFFMAN, BOERHAAVE, DE HAEN, HARTLEY,

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* Reaſoning from *analogy*, ſome ſolvent may yet be expected for this common and excruciating diſorder. When a GALL-STONE has obſtructed the duct, *jaundice* is produced, and the pain of paſſing the ſtone into the duodenum is oftentimes more terrible than the pains even of the moſt difficult labour.

Kirkpatrick, &c. on the *good effects* of ALKALINE WATERS, SOAP, and LIME WATERS, on the *arthritic* and *calculous affections* *, it appears to me, ſays Monſ. Fourcroy, more proper to aſcertain the exiſtence of an *analogy* between theſe *two kinds of concretions*, than the former are capable of *diſproving it*. It muſt, however, be allowed, as Monſ. de Morveau obſerves, that experiment alone is ſufficient to decide *the queſtion*, which affords an additional proof *of the great importance of* CHEMICAL RESEARCHES *in the art of medicine, and the advantages it promiſes to that uſeful ſcience.*

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* That *mineral*, or *volatile alkali*, have been uſeful in the above diſorders, has been affirmed by experienced phyſicians; and I know an inſtance myſelf of *mineral alkali* and *nitrous ammoniac* being ſerviceable in a pulmonary complaint of ſome ſtanding.

The lungs of that moſt horrid villain Barker, who, in order to *celebrate* his jail deliverance with ſome others, wantonly murdered an inoffenſive man on Saffron Hill, was found throughout replete with *calcareous matter*. The Head Conſtable had been wounded by this miſcreant ſome years before, and had never enjoyed ſince that time any health. As he recognized, unexpectedly, the wretch at the inſtant of his execution in Hatton Garden, he was ſo ſtruck with the awful occaſion, and *the retributive hand of* Providence, that he was forced to relinquiſh his duty, and had ſcarcely reached home before he breathed his laſt.

THE SOLUTION OF CALCULI

BY

ALKALINE REMEDIES.

Books and tradition never fail to offer a multitude of medicines for diſeaſes that are frequent and incurable; many of theſe medicines are the ſuggeſtion of the moſt fantaſtic analogies*, and the greater part are incapable of even palliating for a moment the ſufferings of the patient; yet a liſt, at firſt ſight ſo unpromiſing, is not *abſolutely* without its uſe. *The phyſician ſtalks abroad with an air of greater dignity when he feels a full quiver at his ſhoulders, however blunt may be the arrows it contains*;

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* There exiſts, probably, no human malady, not even the jaundice, conſumption, aſthma, or cancer excepted, for which ſo many whimſical and nugatory means of relief have been propoſed, as for the STONE and GRAVEL. Beſides an infinity of inefficacious ſimples, the whole ſeries of remedies, from *the warm goat's blood of* ALEXANDER TRALLIANUS, *the pounded glaſs of* BERICELLUS A SANCTO MARCO, *the eſſence of pigeon's dung of* JOHANNES POPPIUS, *the quinta eſſentia urinæ humanæ of* FABRI, down to *the ſpiritus microcoſmi e ſtercore humano* of another chemical or alchemical doctor, at once afford a proof of the inefficacy of each particular medicine, and of the prevalence of a diſorder, which could enforce ſo much attention, and ſuggeſt *ſo many extravagant projects.* Dr. BEDDOES.

and it ſupplies a ſtaff, however feeble, on which the wearied ſpirits of the patient may reſt, and defers a little that ſeaſon of ſettled gloom when futurity has nothing farther to promiſe to hope.

But from all the teſtimonies that have fallen under my obſervation, continues the juſtly celebrated and philanthropic Dr. BEDDOES, I can collect that, during the former part of the preſent century, ſome approaches have been making towards a remedy, which, whatever *may be its mode of operation*, or *preciſe degree of efficacy*, is *undoubtedly* capable both of *relieving pain*, which renders the diſorder ſo formidable, and *of ſuſpending the progreſs of the diſeaſe itſelf.*

As early as the year 1721, ROBINSON propoſed *ſalt of tartar*, among other things, as a SOLVENT for *the ſtone.* In diſorders of the uropoetic organs, whether ariſing from concretions or not, HOFFMAN praiſes the efficacy of the hot *alkaline* ſprings of Germany, as well as the *ſalt* obtained from the waters of CARLSHAB.

Mrs. STEPHENS having met by accident with a receipt for the STONE, conſiſting of *egg-ſhells* dried in an oven and powdered, ſhe adminiſtered it to ſeveral perſons afflicted with that diſeaſe. Afterwards ſhe burnt the egg-ſhells, which became at firſt black, but being kept longer in the fire, turned to a grey colour, bordering on a perfect white. After ſome trials of theſe black and grey powders in the quantity of as much as would lie on a ſhilling, three times a day, it appeared to her that the powder was more efficacious in proportion as the egg-ſhells were more burnt. But finding that it often cauſed great coſtiveneſs, ſhe added a ſmall quantity of *ſoap* occaſionally, to each doſe, with a view to prevent this inconvenience. And thus ſhe continued giving the *burnt egg-ſhells* with a ſmall quantity of *ſoap* for ſeveral years, curing GRAVELLY COMPLAINTS thereby, and ſometimes DISSOLVING STONES IN THE BLADDER. After twelve years, ſhe gave her powder in larger doſes to one Mr. COXON, adding to it very frequently *half an ounce of ſoap* in decoction. He had the ſymptoms of A STONE in his bladder, *voided*, while taking the remedy, many *concave* and *convex ſcales*, with ſome *ſolid fragments of ſtone*, grew at length *perfectly well*, and never after that had any return of his complaint. He died at the age of eighty. As this gentleman had received a more conſpicuous cure than any other perſon before him, Mrs. STEPHENS began to augment the *quantity of the powder* and *the ſoap*, and found them attended with proportionably greater ſucceſs.

In the year 1735, the Hon. EDWARD CARTERET, Eſq. *Poſt-Maſter General,* began Mrs. STEPHENS's medicines, and received *great benefit.* This engaged the attention of the public, and more particularly of ſuch as were afflicted with the ſtone or gravel, ſo that the number of perſons that took her medicine increaſed every day.

In the year 1737, the cures performed were ſo many, and ſo well atteſted*, that the ſpeedy publication of them

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* Mr. BOLTON having obtained a cure by Mrs. STEPHENS's medicine, wrote to Dr. HARTLEY as follows, from NEWCASTLE upon TYNE.

DEAR SIR,

A more particular and exact account of all that have taken Mrs. STEPHENS's medicines, when it comes out, muſt be a great and moſt convincing proof of the good effects of them, and prevail on the charitable part of this nation to put a helping hand towards ſo univerſal a good, and the unſpeakable benefit the poorer ſort may reap from it.

For my own part, I thank God I am ſo perfectly cured of the ſtone by taking them, that I never ſince have felt the leaſt ſymptom of pain from that diſtemper with which I had been ſore afflicted about two years before, and could not endure to ride on horſeback, which exerciſe I can now bear with pleaſure.

I took all the things before this that I could hear of in this country to make me eaſy, but without effect. I began the medicines in much pain, which, with ſome intermiſſion, continued for about a fortnight, and then it abated, and I was ſomewhat eaſy; but had more or leſs of pain, night and day, with ſome remiſſion indeed, during the time of taking the remedy. I did not hear of any that complained ſo much as I did; perhaps the ſtone might be of a harder nature than uſual, and might not diſſolve ſo kindly as in others, them was judged to be of great importance to mankind: and accordingly, in the year 1738, a propoſal for raiſing 5000l. by voluntary contributions, as a reward to Mrs. STEPHENS

others, but by perſiſting in the medicines, the ſtone began to diſſolve and come away in bits, and I was then more eaſy.

Mr. BINFORD and Mr. HOLLAND both took the medicines at the ſame time I did; they each came to ſhew me what came from them, and to compare with me. I obſerved that the operation was the very ſame with them, having juſt ſuch bits as I had, and at the laſt a larger hard ſtone, which appeared to be the *kernel.* They were ſo much alike that one would think they all came from the ſame perſon. The bits are perfect ſtone, only *ſoft* at coming away; but laid on a paper they ſoon dry to be perceived what they are. It is a ſurpriſing medicine, and would be of great uſe, and if known, a vaſt kindneſs to poor people, who are not able to give the price it now is. The manual operation is come to perfection; yet how muſt the poorer ſort come at it in the country, when they cry out for ſome aſſiſtance?

Since my recovery to health and ſtrength, ſome of the poor pit-men in pain and diſtreſs have been to enquire of me what I took. When I told them they complained lamentably of their affliction and poverty, not being able to pay the price of the medicines. Some are ſince dead. For while they ſtrive to labour under ſuch grievous pain, they periſh for want of relief, and it is hoped all good and well-diſpoſed Chriſtians, who have any charity or benevolence for mankind, will conſider and promote the noble deſign you have undertaken.

I have the honour to be, &c.

Vide alſo the caſe of Mr. UNDERWOOD in the frontiſpiece.

Dr. HARTLEY having himſelf commenced Mrs. STEPHENS's medicine, voided in conſequence *many fragments of ſtone,* and feeling leſs pain than before, and being better able to jumble over the pavement in London, he conceived a high opinion of the efficacy of Mrs. STEPHENS's remedy. He therefore collected and publiſhed 154 trials. Several of the caſes were drawn up by the perſons themſelves, or written from their accounts. "If," ſays he, "I have flattered myſelf with falſe hopes, it is eſpecially my intereſt to be undeceived, and my duty to acknowledge my error. But if, on the contrary, I have ſatiſfactorily

STEPHENS for diſcovering her medicines, was preſented before the public with *her conſent* *.

As this propoſal, however, did not meet with the expected ſucceſs, ſhe was adviſed, in the beginning of the year 1739, to apply to the HOUSE OF COMMONS for the above-mentioned reward, ſubmitting her medicines, when diſcovered, to ſuch examination as the Houſe ſhould think right, before the payment of the reward. This ſhe did, and a bill was brought in for the purpoſe, which

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factorily proved a diſſolving power in the medicated urine, Mrs. STEPHENS will appear to you (the College of Phyſicians) in a different light from the common pretenders to *noſtrums*, and you will not think the meaſures that have been taken by me *to obtain the publication of her medicines*, any encouragement of an IMPOSTOR. Vide p. 53, par. 2.

* From April 1738 to February 1739, the ſubſcription was open, and near 1,400 l. was collected. Among the liſt of ſubſcribers we note, with pleaſure, the illuſtrious names of *ſeveral eminent phyſicians*.

MRS. STEPHENS'S PROPOSALS were,

I. As ſoon as 5,000 l. are raiſed by voluntary ſubſcription, Mrs. STEPHENS ſhall diſcover her medicines, and they ſhall be made public.

II. That time ſufficient for the trial of her medicines ſhall be given, and ſhe ſhall receive the 5,000 l. contribution, if it ſhall appear to the Archbiſhop of Canterbury, the Duke of Richmond, the Earl of Pembroke, &c. that *theſe medicines are able to diſſolve ſtones in the bladder*;—but if THIS *does not clearly appear*, THE PRINCIPAL SHALL BE RETURNED TO THE CONTRIBUTORS.

Surely no propoſal could be more *fair* or *honourable* to *one party*. Dr. HARTLEY has emphatically marked in italics, among the liſt of ſubſcribers, the names of but *two* biſhops and *one* ſurgeon !

which paſſed BOTH HOUSES, and had the ROYAL ASSENT at the concluſion of the Seſſions, June 14, 1738. She next preſented a paper, containing her method of preparing and giving her medicines, to his Grace the Archbiſhop of Canterbury, June 16th following. Trials were made with the medicine thus diſcovered. They were found to produce the promiſed effects; the truſtees named in the Act of Parliament met March 5, 1740, gave Mrs. STEPHENS the certificate required by that act, *and ſhe received the* 5,000 l. *reward* at the EXCHEQUER, March 17th following.

EXTRACT FROM THE GAZETTE, MARCH 18, 1740.

1. Mr. GARDINER*, of *Fetter-lane*, aged 61, had the uſual ſymptoms of a STONE in the bladder, with *violent pains* for ſeveral years. He was ſearched by Mr. NOURSE, ſurgeon, Dec. 30, 1738, when both he, and Mr. WALL, apothecary, felt a STONE in the bladder. Mr. GARDINER took the medicines about eight months, *voided* MANY PIECES OF STONE in that time, was FREED FROM ALL HIS SYMPTOMS; and being ſearched again, firſt by Mr. SHARP, Sept. 14, 1739, and

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* Theſe were the ſelected perſons, on whom the medicines were tried, and who were examined by the HOUSE on oath.

then on the 30th of November following by Mr. NOURSE, Mr. CHESELDEN, Mr. SAINTHILL, and Mr. BELCHER, ſurgeons, NO STONE COULD BE FOUND.

2. PETER APPLETON, of *Black-friars*, aged 67, had *the ſymptoms of* A STONE *in the bladder for more than ſeven years*, with *exceſſive pains for the five laſt years of that time.* He was ſearched July 6, 1739, by Mr. SHARP, and found *to have a ſtone in the bladder*, which ſtone was alſo felt by Dr. PELLET, Dr. NESBIT, Dr. WHITAKER, and Dr. HARTLEY, and judged *by all preſent* to be a *large one.* He took the medicines for about five months, during which time *he voided a very large quantity of ſtone in flakes and ſmall fragments.* He grew QUITE FREE FROM ALL HIS COMPLAINTS, and was ſearched again, firſt by Mr. SHARP, Nov. 9, and afterwards by thirteen phyſicians and ſurgeons; BUT NO STONE COULD THEY FIND.

3. HENRY NORRIS, of *Leather-lane*, aged 55, had the ſymptoms of a ſtone in the bladder for about a year and a half. Auguſt 17, 1739, he was ſearched by everal phyſicians and ſurgeons, who *all* felt THE STONE. He took the medicines about four months, and voided only A THICK SEDIMENT in that time, however *he was*

free from all his ſymptoms;—and being ſearched again, Dec. 14, by eight phyſicians and ſurgeons—NO STONE COULD BE FOUND.

4. WILLIAM BRIGHTY, of *Colcheſter*, aged 79, had the ſymptoms of ſtone in the bladder for more than three years. He was ſearched Sept. 8, 1739, by Dr. GARDINER and Mr. SHARP, and found to have A STONE. He took the medicines for about four months, *voided many pieces of ſtone during that time, became free from all his ſymptoms*; and being ſearched again by Dr. GARDINER, Mr. SHARP, and Mr. BELCHER,—NO STONE COULD BE FOUND.

Out of 154 caſes* publiſhed with a view to recommend Mrs. STEPHENS's remedy to the notice of the public, by the celebrated DAVID HARTLEY, M. D. and which he addreſſed to the Preſident and Fellows of the Royal College of Phyſicians, I ſhall only extract the caſe of Dr. KIRKPATRICK, an eminent practitioner of phyſic in Ireland. Perhaps it might be ſerviceable to mankind, if phyſicians, attentive to the progreſs of ſcience, and their own feelings, were, from time to time, to become martyrs to thoſe diſeaſes for which remedies are ſtill wanting, or are but newly introduced.

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* Vide note p. 48.

DR. KIRKPATRICK's CASE.

For theſe ſixteen years paſt I have been afflicted with the gravel in the kidneys, and after the uſual paroxyſms of vomiting, &c. the uſe of the warm bath, emollient clyſters, &c. have paſſed divers ſtones. The laſt of theſe ſevere fits was in July 1737; I then paſſed a ſmall ſtone, and have ſince that period been ſubject to violent attacks of ſtrangury.

1738.

Oct. 17. I began Mrs. STEPHENS's medicines.

18. The urine ſmelt *ſtrong*, and my *pains* were increaſed, which were almoſt continual. I paſſed one *oblong angular bit of ſtone* that day.

19. The urine full of *white ſediment*, and continues ſo. Frequent *ſtoppage*. Great *pain*.

20. Frequent ſtoppage. Paſſed 1 *angular broad flake of ſtone*.

21. Leſs *pain*. Paſſed 3 *flakes of ſtone*.

22. Leſs *pain*. Paſſed *many angular bits*, but ſmall. Extreme *pain* for half an hour.

Oct. 23. Paſſed more than 12 *white flakes of ſtone*, and above 20 *ſmall angular bits*. In my microſcope, the flakes appear very diſtinctly like pieces of rotten rock rent aſunder.

24. Paſſed *as many flakes* to-day as yeſterday. Some of them WHITE on one ſide, and a little REDDISH on the other.

Obſervations. I apprehend the WHITE SIDE is that expoſed to the medicated urine, and the OTHER SIDE is that which is broke off from the *main ſtone*, whoſe *colour* it may be ſuppoſed to have.

Since I have taken Mrs. STEPHENS's medicine my urine is become ALKALINE, that is, it turns ſyrup of violets *green*, and *ferments* with acid liquors. This I thought very remarkable when I firſt obſerved it, and began to hope, that urine, which was ſo different from common urine, might have different effects upon ſtones in the kidneys and bladder. And I have lately been informed, that even common urine, when it putrefies, that is, turns ALKALINE by being kept, will diſſolve and take up the *calculous incruſtations* upon the ſides and bottoms of the urinals. I boiled different pieces of ſtones, which were taken from the human bladder, in my own ALKALINE urine, and common urine. The firſt were waſted conſiderably, and their ſurface turned WHITE and SOFT:—but thoſe in common urine had little effect produced on them.

I ſhall continue to ſend you an abſtract of my diary, which I keep very exactly. I conſtantly confine myſelf to my chamber, that by a ſtate of reſt the medicated urine may lie longer upon the ſtone. I believe you will think this account as encouraging as could be expected in nine days. I confeſs the event has much exceeded my expectations. Such as it is I have ſent it, that I might *do juſtice to* Mrs. STEPHENS, and alſo *to* THE PUBLIC. I long much to know the ſtate of the ſubſcription, and whether you be able to make any probable calculation when it will be completed, that the public may have the knowledge of this GLORIOUS DISCOVERY*.

Oct. 25. Paſſed 37 *flakes of ſtone*, 3 thicker than uſual, and one of them much larger than any of the former. Much *white ſediment*, many *angular bits*.

26. Paſſed 68 *flakes of ſtone*, many of them equal to the largeſt of the former

27. Paſſed 64 *flakes*.

28. Paſſed 90 *flakes*.

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* Vide note * p. 50.

Oct. 29. Paſſed 38 *flakes*, 2 of them a quarter of an inch broad.

30. Paſſed 34 *flakes*.

31. Paſſed 56 *flakes*.

Nov. 1. Paſſed 29 *flakes*.

Obſervation. All I have paſſed are CONVEX and WHITE on one ſide, CONCAVE and BROWN on the other.

2. Paſſed 6 *flakes*.

3. NO FLAKES or BITS.

4. }
5. } NO FLAKES.
6. }

Obſervation. There appears a kind of ſtop in the operation of the medicine, though my mode of living is the ſame, and I take my medicine regularly.

Perhaps the OUTWARD COAT of the ſtone is come away, and the INTERNAL COAT is much *harder*, and requires more time in being diſſolved and broken down.

I have had throughout *great pain* in paſſing my water, but eſpecially theſe laſt four days. Having gathered a large tea ſpoonful of the *white ſediment*, and drained off the urine from it as well as I could, I left it three days in the open air, and found the urine evaporated, and the ſediment grown into *a ſolid calculous maſs*, which I broke into pieces. Theſe had the ſame appearance in my microſcope as *the flakes of ſtone* which I had paſſed. I think this ſeems to prove that *the white ſediment* is really a part of the ſtone, reſolved into an impalpable powder.

Nov. 7. Paſſed 1 *flake*, and 1 *angular bit.*

8. Paſſed 1 *flake.*

9. Paſſed 2 *bits* of the ſame ſubſtance with the *flakes*, but ſofter.

10. Paſſed 2 *flakes*, pretty large, one of them having the ſurface of a ſphere, or like the top of a braſs nail, with a convexity and concavity; alſo 1 *bit* of ſtone, of a dirty colour, with *veins of white.*

11.
12.
13. } Paſſed no flakes, but *divers angular bits*, with much *white ſediment*,—PELLUCID MUCUS, and VERY GREAT PAIN.
14.
15.

My pains have been great throughout, but *moſt* when *this mucus* paſſes from me. Sometimes I imagine this mucus is no more than *the mucus* ſecreted from the glands of the bladder and urethra, contrived by PROVIDENT NATURE to ſheath the acrimonious ſalts of the urine, that they might not offend the tender parts through which they paſs; and that THE ALKALINE MEDICATED URINE is ſo *very deterſive* as to wear off and ſcour away this mucus, leaving the bladder and adjoining parts exceeding bare, and conſequently obnoxious to pains raiſed by the ſtony particles, angular bits, and coarſer parts of the ſediment while paſſing*.

Beſides the diſagreeable taſte of Mrs. STEPHENS's SOLVENT, and its frequently nauſeating the ſtomach, its cauſtic and irritating effects on the animal ſyſtem, and the urinary paſſages in particular, were great diſcouragements to its liberal uſe.

Mrs. STEPHENS's *medicines*, notwithſtanding the great relief they had afforded to many, were therefore ſoon laid aſide. They were, however, laid aſide *with regret*, ſince this inference ſeemed to be warranted by the whole ſum of facts, that *much benefit* might be derived from them, provided their COLLATERAL BAD EFFECTS could be obviated. Could *theſe inconveniencies* be removed by any combination, that would ſtill leave *the alkaline ſalt* at liberty to unite with *the acid*, which is ſuppoſed to contribute to the formation of theſe calculi, the purpoſe of *preventing their being generated*, or *of diſſolving them when formed*, would probably be in a good meaſure anſwered. It was reſerved for a reſpectable member of the medical profeſſion, ſtill living*, to engage THE MODERN CHEMISTRY in the ſervice of medicine, and realize a project, which now ſeemed to be relinquiſhed in deſpair. This gentleman's reflections were quickened by his own feelings, and in 1778, after having been for *eighteen* years ſubject to ſevere paroxiſms, began to take a ſolution of FIXED VEGETABLE ALKALI, ſuperſaturated with CARBONIC ACID† *(charcoal* and *oxygen)*. This medicine very ſoon relieved his ſymptoms, and, as it will appear from the account of his caſe, has kept him *free from pain* for *ten years*, one ſlight attack excepted, which is aſcribed to *the diſcontinuance of the medicine for ſeveral weeks.*

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* We will break off the relation of this caſe here, not to tire our readers with a repetition of the ſame ſtory, obſerving, at the ſame time, that Mrs. STEPHENS's medicines, when once begun cannot be left off, however ſtrong the indications to deſiſt from their uſe; for THE STONE, having become *corroded* and *ſoftened* by the medicated urine, ceaſes to irritate the bladder; but if the medicines are left off, it ſoon returns to a ſtate of hardneſs, and the rugged ſurface occaſions then the moſt lancinating pains.

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* BENJAMIN COLBORNE, Eſq.

† This Gentleman thought that by this means *the alkaline ſalt* would be rendered leſs diſagreeable, and at the ſame time milder, without loſing its well known *lithontriptic quality*; for, as Mr. SCHEELE and Sir TORBERN BERGMAN had proved, that the human calculi in the bladder were made up of *an acid* and *an earth, a double elective attraction* might poſſibly take place,—THE ACID *of the calculus* having a ſtronger attraction for the ALKALINE BASIS of *this neutral ſalt*, would unite with *the alkali* of the neutral ſalt,—while the CARBONIC ACID, being diſengaged from *the neutral ſalt*, might, in its turn, unite alſo with THE EARTH OF THE CALCULUS.—He found alſo, that by infuſing pieces of calculi in the urine of ſuch perſons as were taking the AQUA MEPHITICA ALKALINA, it exhibited a conſiderable *lithontriptic quality*, and having put a fragment of a calculus, weighing 51 grains, into THE ALKALINE NEUTRALIZED SOLUTION, at the end of 31 days it was found to have *loſt* 36 grains of its original weight.

BENJAMIN COLBORNE'S CASE.

BENJAMIN COLBORNE, Eſq. of the city of BATH, in the year 1760, was attacked with a violent nephritic paroxyſm, which, after continuing ſeven or eight days, and being treated with anodyne, oily, and mucilaginous medicines, and bleeding, terminated in the diſcharge by urine, of a red ſtone larger than a vetch or tare, after which he continued tolerably well for eight or ten months; often, however, obſerving ſmall calculous concretions to come away, attended with irritation of the urinary paſſages.

In about ten months after the firſt attack, he had another, but neither ſo violent or of ſo long duration, which terminated like the firſt, in the diſcharge of a ſtone of a ſimilar colour to the foregoing, but of a ſmaller ſize.

The nephritic paroxyſm again returned in about five or ſix months, but not ſo violent as at firſt. During this time he was in a courſe of taking mucilaginous and lubricating remedies.

After this he made trial of Mrs. STEPHENS's remedy, as prepared by Dr. D'ESCHERNAY, of which he took about an ounce in a day, once or twice a week.

After this, *he continued free of nephritic complaints about a year and half.* That medicine, however, agreed ſo ill with his ſtomach, *producing nauſea, indigeſtion, and crudities, that he was obliged to leave it off.*

About three or four months afterwards he had another attack, which returned upon him every ten or twelve weeks.

In the year 1766, he made a trial of BLACKRIE's LIXIVIUM (or Chittick's remedy), and thought it agreed with him rather better than ſoap; yet it was ſo cauſtic and irritating to the mouth and throat, and produced ſuch painful ſenſations in his ſtomach, *that he was obliged to leave it off*; after which his nephritic paroxyſm returned every eight or ten weeks as before.

On March 27, 1778, he had an attack of THE GOUT, which continued on him until the 14th of April, when he was taken with a violent vomiting, attended with pain in the left kidney. By the help of the warm bath and bleeding, he paſſed another calculus. After this he had a ſecond attack of the gout, which continued a few days.

As ſoon as it was over he began the uſe of the *alkaline medicine* with *fixed air*, as above deſcribed*. *During the uſe of this he parted with no gravel, his urine depoſited no ſediment whatſoever, or diſcoloured the veſſel, though if it was omitted even for a few days theſe appearances took place, and ſmall bits of gravel were perceived in his water.*

From this time he continued in perfect health, and *free of all nephritic complaints*, until the 26th of Auguſt 1783, when, about three in the morning, he was taken with an irritation in the urinary paſſages, which prevented his ſleep, his urine however was not high coloured; about ſeven in the morning he had two purging ſtools; he had but-little pain in the kidney, but a heavy obtuſe ſenſation over the os pubis, which continued with ſome ſickneſs till about two o'clock, when the ſtone ſeemed to enter the bladder. From that time he became perfectly eaſy.

In order to diſcharge the ſtone from the bladder, he drank large quantities of mucilaginous liquors, and retained his urine as long as poſſible. About ſix in the evening *he diſcharged a red calculus*, ſmaller than what he had before done.

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* The AQUA MEPHITICA ALKALINA, vide p. 60.

It is proper to obſerve, *that he had been at* HARROWGATE *about four or five weeks before this happened*, and drank the Harrowgate water, which, as it acted not only as a purgative, but as a diuretic alſo, he was induced to think he might *ſafely omit* THE ALKALINE SOLUTION. It appeared however, to his great diſappointment, that the calculus was generated *during that interval.* From that time to the preſent, he has never, for *two days ſucceſſively*, omitted taking the SATURATED ALKALINE SOLUTION, and *has never ſince felt the ſmalleſt uneaſineſs*; *no grains of ſand or other precipitation in the urine*, *nor any diſcoloration of the veſſel*, *except when the medicine is omitted for a day.* But, upon taking the ſolution again, the urine made afterwards *diſſolves the former diſcoloration*, and ſtill continues perfectly *clear*. During the time he was ſubject to nephritic paroxyſms, his urine was ſubject to putrefy very ſoon, but ſince he has taken the ſolution it will keep three or four days in the warmeſt weather without ſhewing any ſigns of that diſpoſition *. HIS HEALTH, STRENGTH, AND SPIRITS,

ARE

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* A piece of mutton being put into 8 ounces of SPRING WATER, into the ſame quantity of WATER SATURATED WITH THE CARBONIC ACID, and into the ſame quantity of THE ALKALINE SATURATED SOLUTION,

and

ARE ALL PERFECTLY GOOD; AND, AS HE THINKS, BETTER THAN THEY WERE TWENTY YEARS AGO.

Experience has ſince amply confirmed the virtues of a medicine, which, I apprehend, may be *freely taken without danger*, and even *without inconvenience* (except in a few rare inſtances), and which ſeems to have deſerved the ſingular praiſe of *equalling* the expectations raiſed by the perſon who firſt propoſed it.

But when we conſider the high price and brittleneſs of the apparatus, and the care that muſt be uſed in conducting the proceſs, and the neceſſity there is of conſtantly *continuing* the medicine, *a remedy ſeemed ſtill wanting adapted to the condition of the poor, who are by no means exempted from calculous diſorders.*

In the year 1787, a perſon belonging to the medical profeſſion, and much afflicted with the gravel, complained to Dr. BEDDOES that he was unable to perſevere in the uſe of the AQUA MEPHITICA ALKALINA, on account of the great dizzineſs it always occaſioned with him. I was led, ſays this benevolent phyſician, from this intimation

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and all cloſely corked up, and placed in a cloſet in a room wherein a conſtant fire was kept. After 13 days the SIMPLE WATER had acquired a very offenſive and putrid ſmell, the WATER IMPREGNATED WITH THE CARBONIC ACID had only a muſty ſmell, and that which contained THE ALKALINE SATURATED SOLUTION *was perfectly* SWEET. Dr. Falconer.

to reflect upon the ſubject, and after ſome time fell upon a formula, of which I think myſelf fully warranted in aſſerting, that it is *extremely beneficial* in CALCULOUS COMPLAINTS, and that it may, *without injury*, be taken in very *large quantities*, and continued for a *great length of time.* Its SIMPLICITY and its CHEAPNESS are its *great recommendations.* It is SAL SODA, or NATRON, *made into the form of pills with ſoap, or any other cement.* *Bark* and *aromatic* may be occaſionally added. The trials that have been already made of *this remedy* ſufficiently prove it to be at the ſame time both *efficacious* and *harmleſs*; and THIS INVENTION may be truly ranked among the many very *uſeful diſcoveries* that have been made by this excellent and truly philanthropic phyſician.